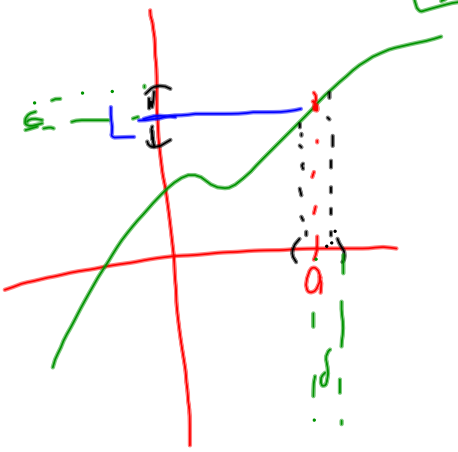
2.4) $f(x)$ defined $\forall x \in (a-\delta, a+\delta)$ – except perhaps $x=a$.

for every (in) (element of)

i.e. $f(a)$ doesn't need to exist

$\lim_{x \to a} f(x) = L$ iff

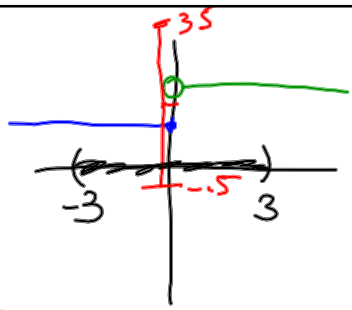


① $\forall \epsilon > 0$, epsilon

② $\exists \delta > 0$ there exists delta

③ such that $\forall x$ in $(a-\delta, a+\delta)$ (except $x=a$) $\Rightarrow f(x)$ in $(L-\epsilon, L+\epsilon)$

$$f(x)=\begin{cases}1 & \text{if } x\le 0\\ 2 & \text{if } x>0\end{cases}$$



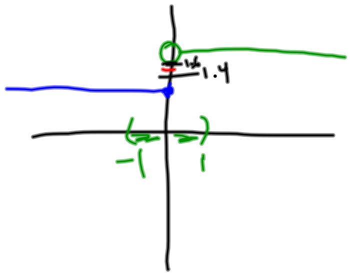
hypothesis: $\lim_{x\to 0} f(x)=1.5$

→ choose $\epsilon=2$

is there a δ so that every x in $(0-\delta,0+\delta)$ has in "f" value in $(-.5,3.5)$?

claim: pick $\delta=3$ ✓

$$f(x)=\begin{cases}1 & \text{if } x\le 0\\ 2 & \text{if } x>0\end{cases}$$



→ choose $\epsilon = .1$

select $\delta = 1$

hypothesis:

$$\lim_{x\to 0} f(x) = 1.5$$

$f\left(\begin{matrix}\text{every } x\\ \text{in the}\\ \text{left part}\end{matrix}\right) = 1$ oops is NOT in $(1.4, 1.6)$

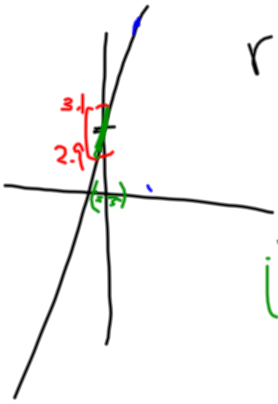
2.11 2

$f(x) = 2x+3$, $\lim_{x \to 0} \overset{f(x)}{2x+3} = 3$

a) suppose $\epsilon = .1$

range of y-values $(f(a)-\epsilon, f(a)+\epsilon)$

$= (2.9, 3.1)$

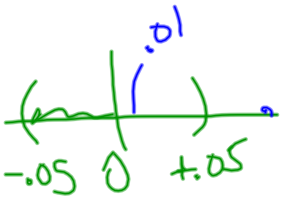


i) can we find c so that $f(c) = 2.9$?

$2(c)+3 = 2.9$

$2c = -.1$

$c = -.05$



ii) can we find a y so $f(y) = 3.1$?

$2y+3 = 3.1$

$-3 \quad -3$

$2y = .1$

$y = .05$

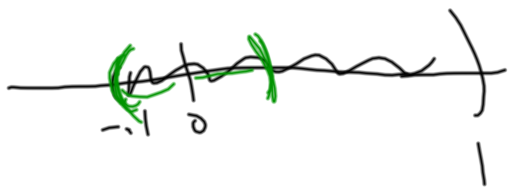
iii) $f(.01) =$

$2(.01)+3 =$

3.02

is this in $(2.9, 3.1)$?

suppose our x-domain or x-interval



2.5/ Continuity

AGAP..... Limits

"new" definitions of

- horizontal asymptotes

e.g. if $\lim_{x \to \pm\infty} f(x) = L$, then $y = L$ is a h.a.

- vertical asymptotes

e.g. if $\lim_{x \to a} f(x) = \pm\infty$ they $x = a$ is a v.a.

2.5) A function $f(x)$ is continuous at $x=a$

iff

the following 3 conditions are satisfied.

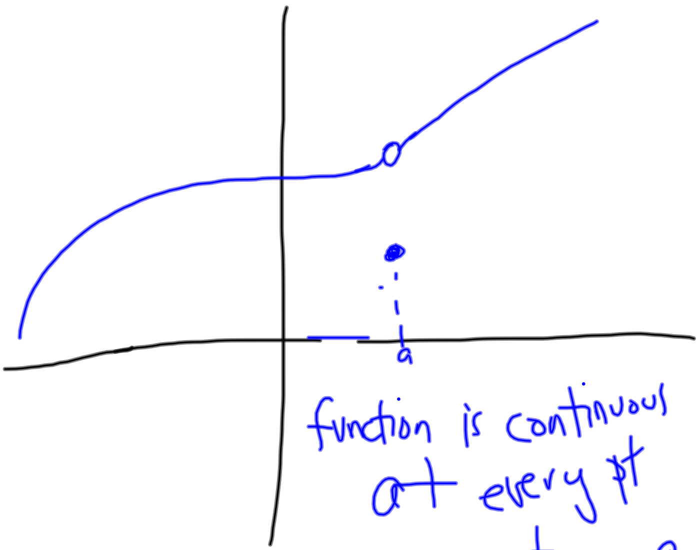
1) $f(a)$ is defined.

2) $\lim_{x \to a} f(x)$ must exist.

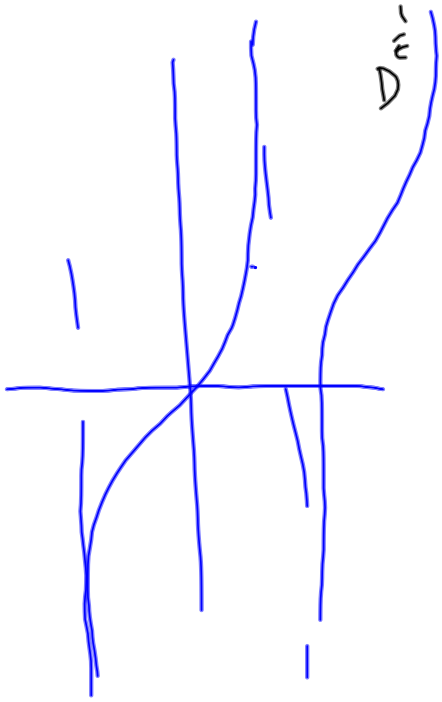
3) $\lim_{x \to a} f(x) = f(a)$

Sep 12-8:07 AM

1) f(a) def 2) lim exists 3) NOT SATISFIED



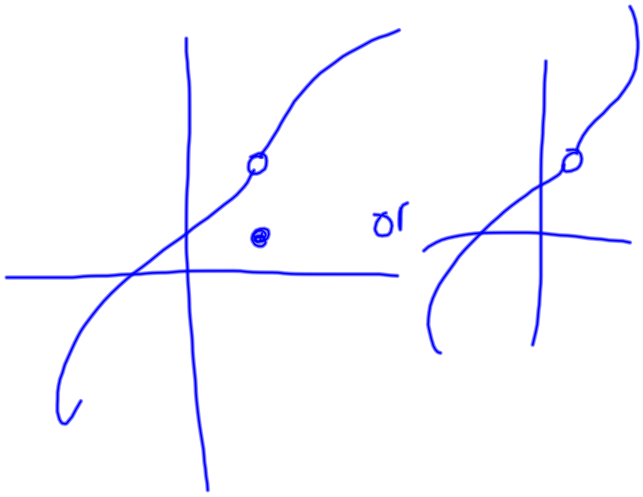
function is continuous at every pt except x=a



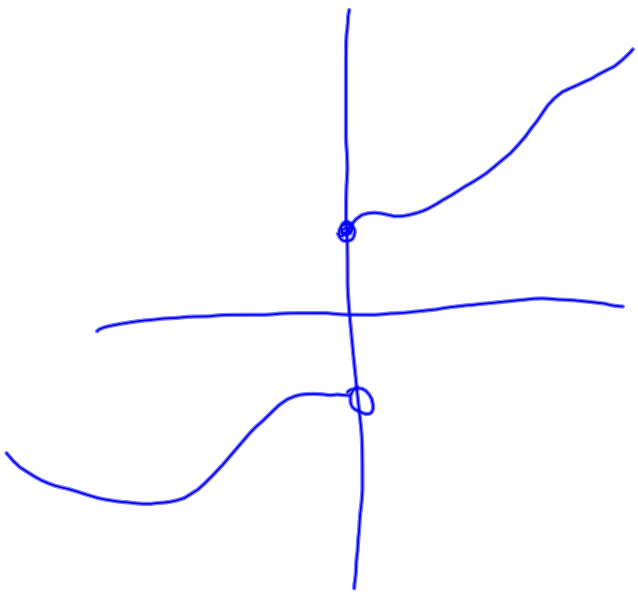
3 types of DISCONTINUITY

1) Removable

→ can make continuous at a point by (re)defining function value



2) jump discontinuity



3) infinite disconuity